U. S. D. A. FOREST SERVICE
RESEARCH PAPER NC-37
1970

defect indicators in Sugar-Maple

A PHOTOGRAPHIC GUIDE

RICHARD M MARDEN , CHARLES L STAYTON

NORTH CENTRAL FOREST EXPERIMENT STATION
U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

LIBRARY FILE COPY

The authors are Principal Forest Products Technologist and Associate Forest Products Technologist, respectively. They are headquartered at the Station's field office in Duluth, Minnesota, which is maintained in cooperation with the University of Minnesota.

North Central Forest Experiment Station
D. B. King, Director
Forest Service
U. S. Department of Agriculture
Folwell Avenue
St. Paul, Minnesota 55101

CONTENTS

Sound Knot 2

Unsound Knot 4

Overgrown Knot 6

Bump 8

Surface Rise 10

Bark Distortion 12

Epicormic Branch 16

Flute 19

Open Seam 20

Overgrown Seam 21

Open Wound 22

Overgrown Wound 24

Callus Overgrowth 26

Burl 28

Bird Peck 29

DEFECT INDICATORS IN SUGAR MAPLE – A PHOTOGRAPHIC GUIDE

Richard M. Marden and Charles L. Stayton

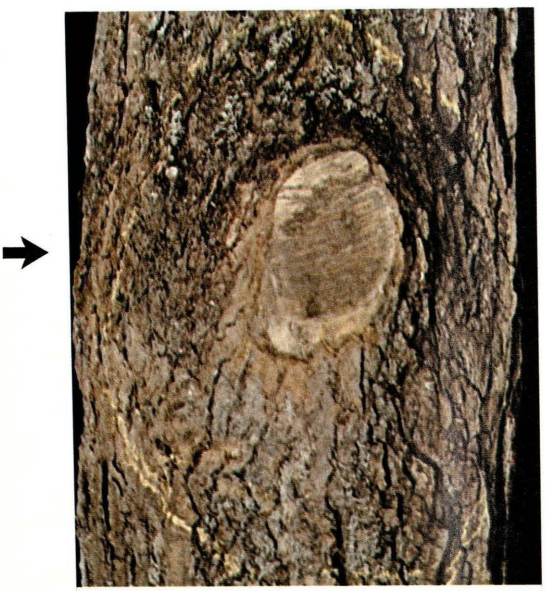
The hardwood tree or log grader has two fundamental tasks: first, he must determine the most valuable use for a tree or log, and second, he must predict the amount and value of the products that will be derived. His success in meeting these objectives will depend on the inherent accuracy of the grading system and on his skill in recognizing exterior defect indicators and correctly associating them with degrade to the interior of the tree. The significance of the exterior indicators and their associated interior defects varies with end products, but whatever the end product, a knowledge of this exterior-interior relationship is required.

To help the grader "see inside" the tree, we photographed the major exterior defect indicators on old-growth sugar maple trees in the Lake States. Then we cut open each tree and photographed the associated interior defects. Careful study of the related photographs, along with the accompanying descriptions, should help the new grader correlate what he can see with what he cannot see, and thus speed up his training. Beyond this immediate benefit, it is hoped also that these photos may facilitate the development of better log and tree grading systems in the future.

Only defects caused by "Natural" or mechanical phenomena are included; disease-caused defects, because of their diversity and complexity, are not treated here.

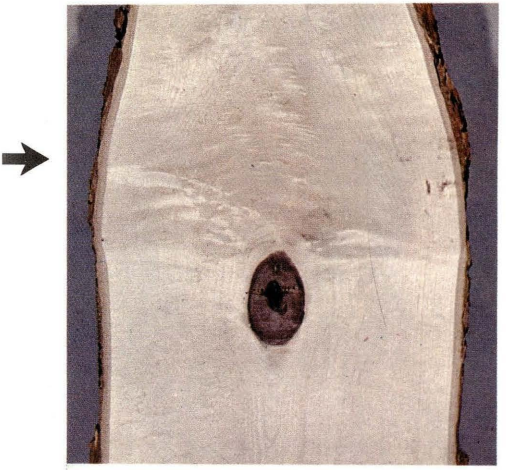
Unless otherwise indicated, photographs are approximately one-third actual size.

SOUND KNOT

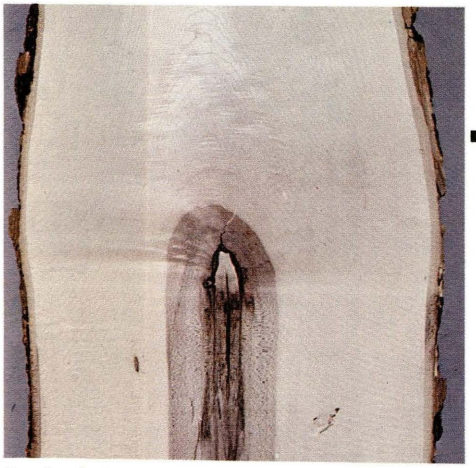


F-519231

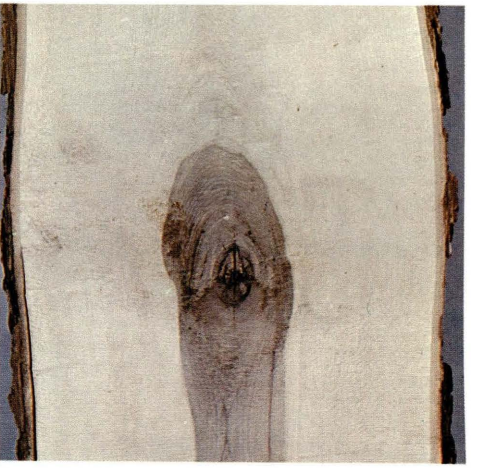
Live limbs are usually sound, or free from decay. In sugar maple, decay begins soon after a limb dies or breaks off. Sound primary limbs continue through the tree to the pith. If the branch is not broken and does not have damaged bark, it is usually sound. Arrows indicate the same point on corresponding exterior and interior photographs. All scales on photographs equal 1 inch.



Depth 3 inches[1] F-519232



Depth 4 inches F-519233



Depth 5 inches F-519234

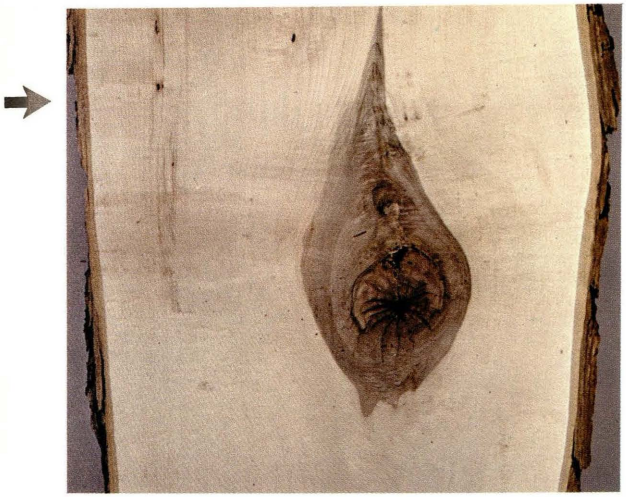
[1]*Depth indicates radial distance inward from bark surface.*

UNSOUND KNOT

F-519235

F-519236

This indicator includes dead limbs or remnants of limbs. They may be protruding from, flush with, or depressed within the bark surface. The exposed wood shows evidence of decay. All primary limbs (sound and unsound) penetrate to the pith of the tree.



Depth 4 inches F-519237

Depth 7 inches F-519238

OVERGROWN KNOT

F-519239

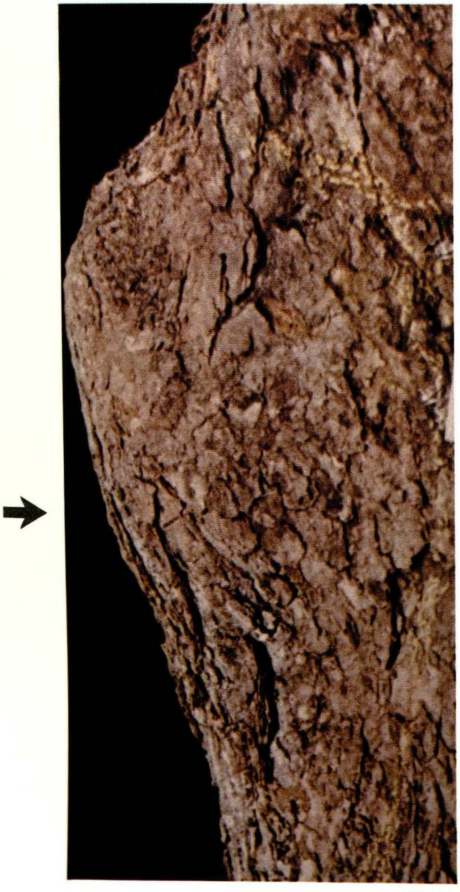
This indicator is a limb stub that has been overgrown with wood, bark, and finally callus tissue. It may or may not protrude beyond the normal contour of the log or tree surface. The limb stub is eventually completely healed over, but it can be identified for many years by a definite circular design of swirls or lines that break up the normal bark pattern.

Depth 1 inch F-519240

Depth 2 inches F-519241

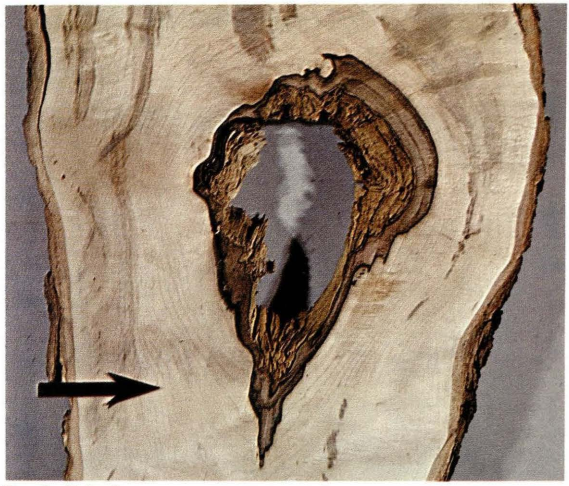
Depth 3 inches F-519242

BUMP



F-519243

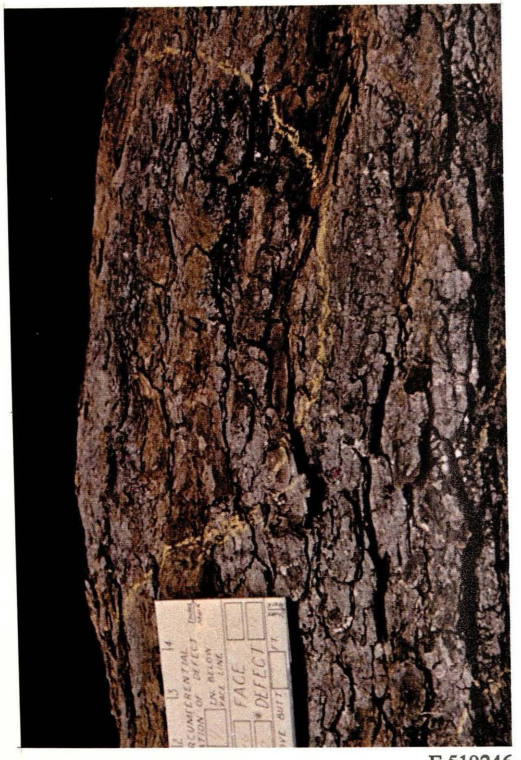
A bump is a circular or elliptical protuberance overgrown with bark. It may be a gradual or abrupt swelling above the normal contours of the tree. The more abrupt bumps have a height-to-radius ratio of less than 1:3 (that is, the average distance from the center to the edge of the bump is less than three times the distance from the normal contour of the tree surface to the outermost extension of the bump). The more gradual bumps have a height-to-radius ratio of less than 1:6 and may gradually taper back in all directions to the normal surface of the log or tree. If the taper ratio is greater than 1:6, the defect indicator is classified as a surface rise.



Depth 3 inches F-519244

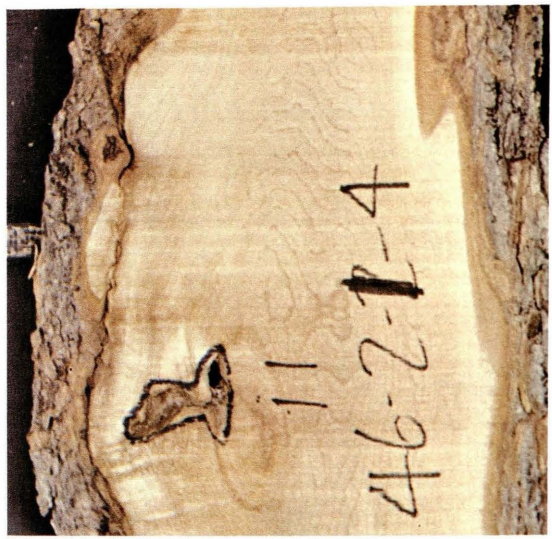
Depth 5 inches F-519245

SURFACE RISE



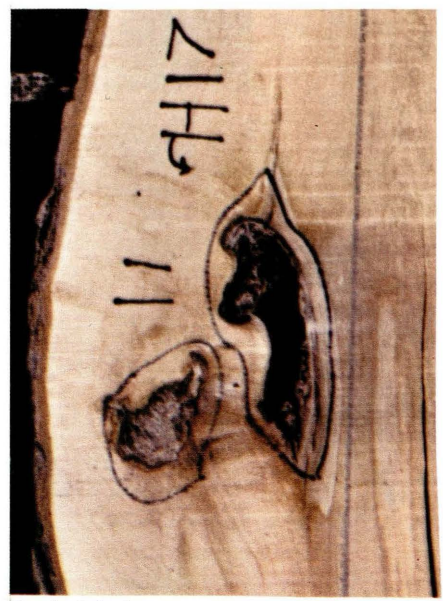
F-519246

A surface rise appears nearly identical to a bump except that its height-to-radius ratio is more than 1:6. Therefore, the surface rise is usually more elliptical than circular in shape. The swelling gradually tapers back to the normal contour of the log or tree surface.



Depth 1 inch F-519247

Depth 2 inches F-519248

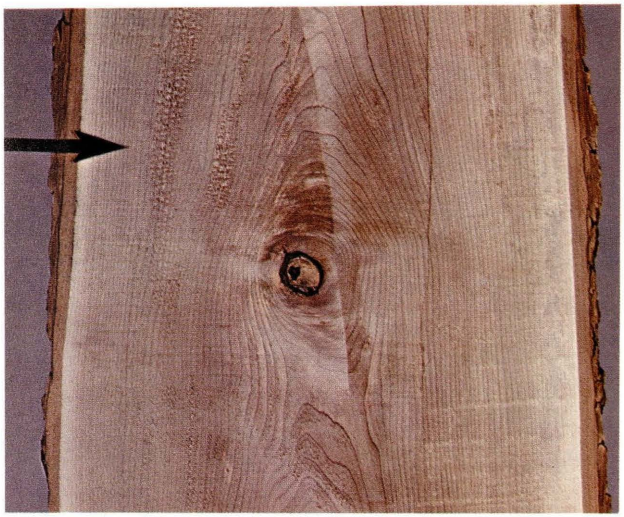


Depth 3 inches F-519249

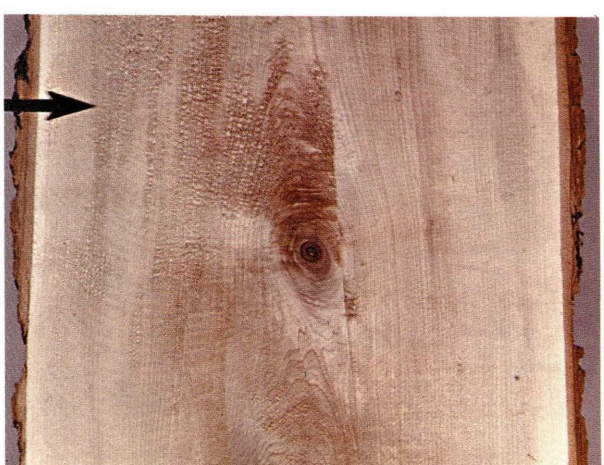
BARK DISTORTION

F-519250

A bark distortion is an interruption in the normal bark pattern; it may be a distinct horizontal break, or it may merely be a faint change in arrangement of plates and fissures. The distortion is usually circular and sometimes slightly elevated above the surrounding surface. The faint bark distortions are commonly overlooked by graders, but often even these have underlying defects. The bark distortion may be a late stage in the healing of another defect, such as an overgrown knot or an epicormic branch.



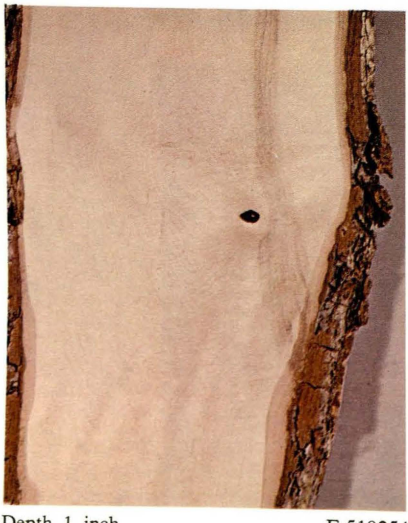
Depth 3 inches F-519251



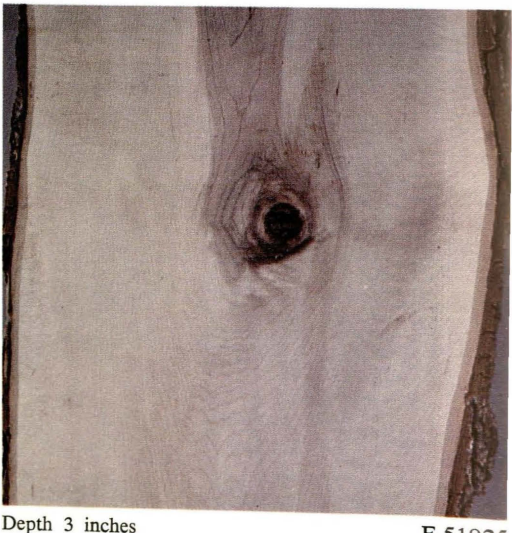
Depth 4 inches F-519252

BARK DISTORTION

F-519253



Depth 1 inch F-519254



Depth 3 inches F-51925

BARK DISTORTION

F-519256

Depth 3 inches

F-519257

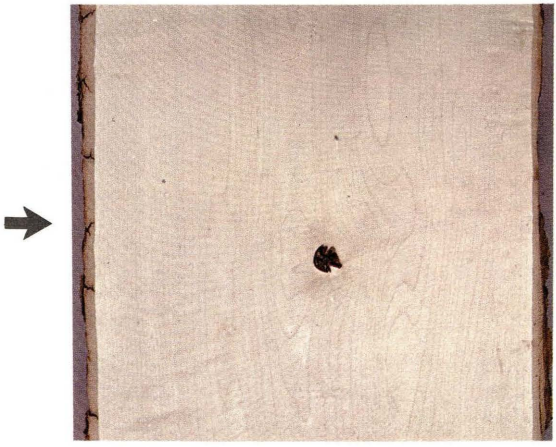
EPICORMIC BRANCH

F-519742

Epicormic branches normally appear as small sprouts on the bole of the tree. Overgrown epicormics are characterized by a puckered circular pattern with a distinct center.

EPICORMIC BRANCH
(Overgrown)

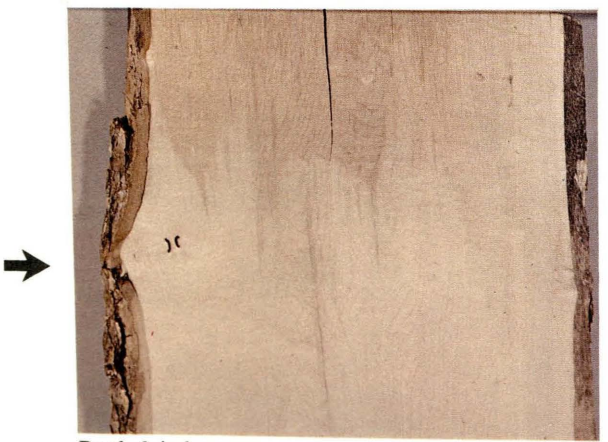
1 inch F-519259



Depth 2 inches F-519260

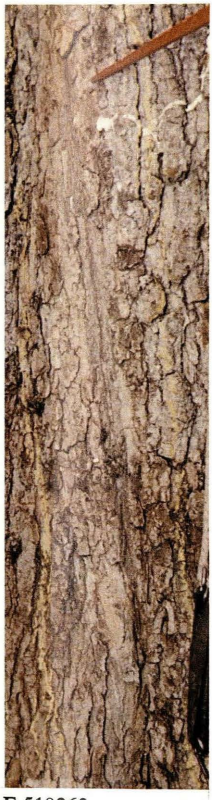
EPICORMIC BRANCH
(Overgrown)

1 inch F-519261



Depth 3 inches F-519262

FLUTE

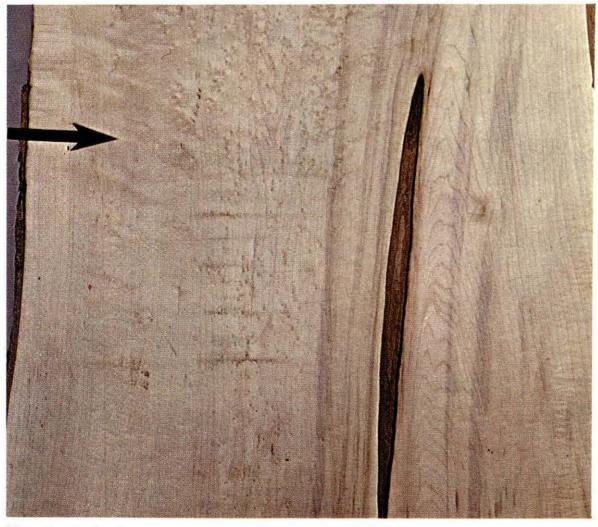


F-519263

⟷ 1 inch

View of cross-cut section

⟷ 1 inch F-519265



Depth 3 inches F-519264

Flutes are narrow vertical depressions of varying length and depth that contain unbroken bark. They generally begin and end within the first 8 feet of the tree bole.

OPEN SEAM

F-519266

Open seams are vertical radial separations of the wood fibers that are not overgrown with callus tissue or wood and bark. They are generally caused by wind, lightning, or frost.

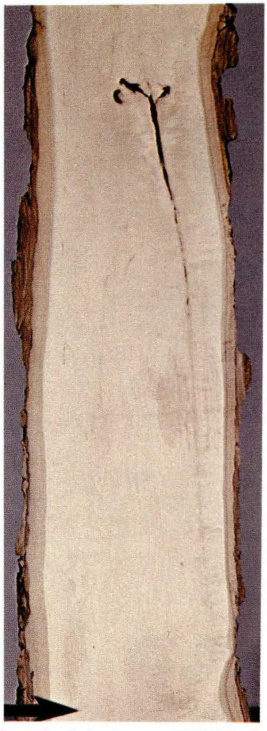
View of cross-cut section

Depth 2 inches F-519267

F-519268

OVERGROWN SEAM

F-519269



Depth 1 inch

F-519270

View of cross-cut section

F-519271

Overgrown seams are vertical radial separations of the fibers that are overgrown with callus tissue or wood and bark. They are generally caused by wind, lightning, or frost.

OPEN WOUND

F-519272

Open wounds are damaged areas on the stem where the bark has been removed, exposing the sapwood and sometimes the heartwood. These wounds can be caused by falling trees, by trees or limbs rubbing against each other, by logging equipment, and by animals. A triangular wound at the base of a tree is referred to as butt scar.

Depth 3 inches F-519273

Depth 4 inches F-519274

Depth 5 inches F-519275

OVERGROWN WOUND

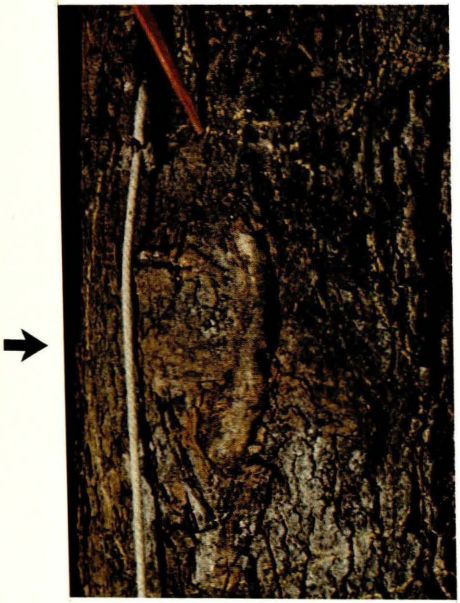
F-519276

Overgrown wounds are damaged areas on the tree stem that are overgrown with callus tissue or wood and bark. The wounds are caused by falling limbs and trees, logging equipment, and animals.

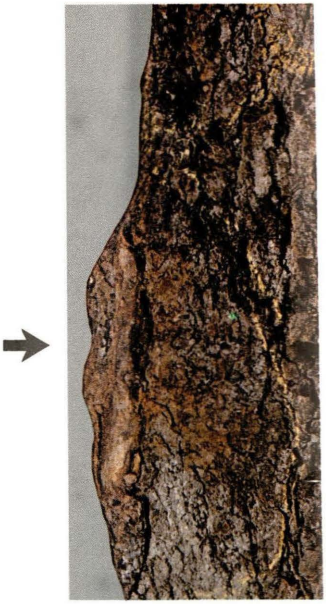
Depth 1 inch F-519277

Depth 2 inches F-519278

CALLUS OVERGROWTH



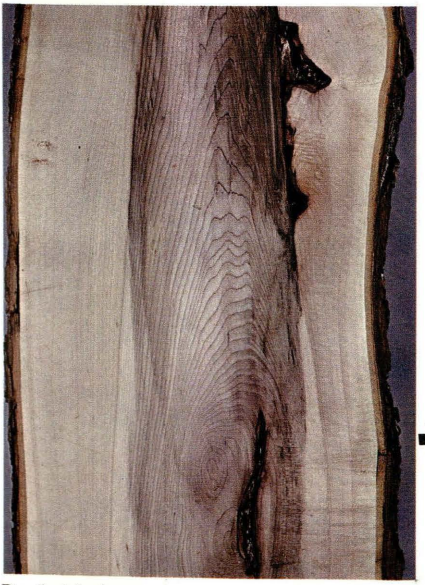
F-519279



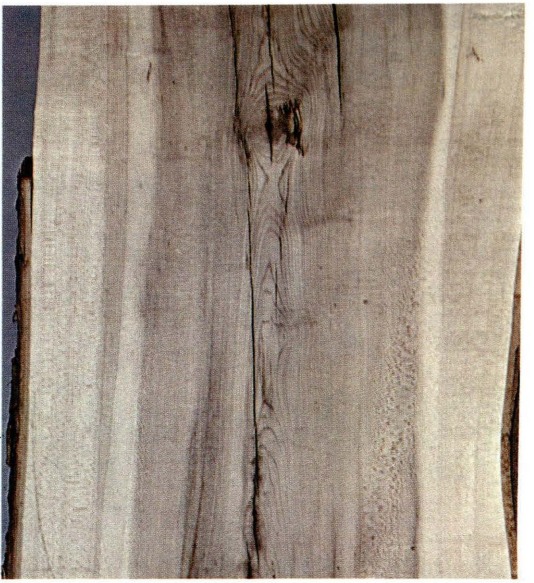
F-519280

Callus overgrowth indicators appear similar to bumps and surface rises except that they are not completely overgrown with bark. They have ridges of exposed woody callus that tend to overlap to one side of the wound. Although they usually cover wounds, they are distinctly different in appearance from overgrown wounds.

Depth 3 inches F-519281



Depth 4 inches F-519282



Depth 6 inches F-519283

BURL

F-519284

F-519285

A burl is a circular, abnormal woody growth with smooth or corrugated surfaces. Burls range in size from small knobs to large growths that may encircle the stem.

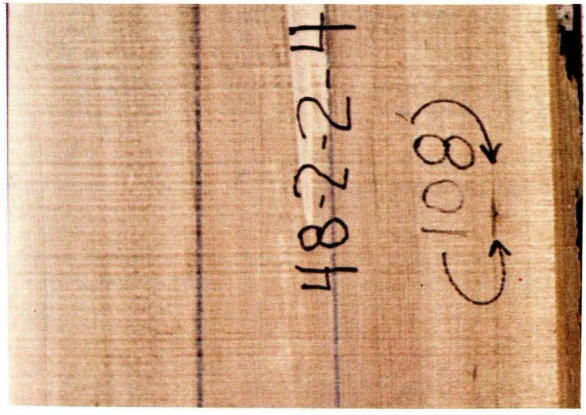
Depth 2 inches

F-519286

BIRD PECK

F-519287

Bird peck refers to holes made in trees by sapsuckers. These holes may extend to different depths in the bark, or completely through the bark into the cambium layer. When fresh, the holes are open and not occluded by callus tissue. Older peck holes may be partially occluded or completely filled with callus tissue. Bird peck holes usually exhibit a horizontal row pattern on the stem, but occasionally the holes are distributed randomly.



Depth 2 inches F-519288

SOME RECENT RESEARCH PAPERS OF THE NORTH CENTRAL FOREST EXPERIMENT STATION

Shrinkage and Footage Loss from Drying 4/4-Inch Hard Maple Lumber, by Daniel E. Dunmire. U.S.D.A. Forest Serv. Res. Pap. NC-24, 10 p., illus. 1968.

Topography and Soil Relations for White and Black Oak in Southern Indiana, by Peter R. Hannah. U.S.D.A. Forest Serv. Res. Pap. NC-25, 7 p., illus. 1968.

A System for Classifying Wood-Using Industries and Recording Statistics for Automatic Data Processing, by E. W. Fobes and R. W. Rowe. U.S.D.A. Forest Serv. Res. Pap. NC-26, 22 p., illus. 1968.

The Influence of Light, Moisture, and Seedbed on Yellow Birch Regeneration, by Carl H. Tubbs. U.S.D.A. Forest Serv. Res. Pap. NC-27, 12 p., illus. 1969.

Prescribed Burning Weather in Minnesota, by Rodney W. Sando. U.S.D.A. Forest Serv. Res. Pap. NC-28, 8 p., illus. 1969.

Durable Rustic Wooden Signboards, by Glenn A. Cooper. U.S.D.A. Forest Serv. Res. Pap. NC-29, 15 p., illus. 1969.

The Market for Wood Picnic Structures, by Jerry A. Sesco. U.S.D.A. Forest Serv. Res. Pap. NC-30, 7 p., illus. 1969.

Oak Forests of the Lake States and their Management, by John L. Arend and Harold F. Scholz. U.S.D.A. Forest Serv. Res. Pap. NC-31, 36 p., illus. 1969.

Wildlife Esthetics & Auto Campers in the Superior National Forest, by David W. Lime and Charles T. Cushwa. U.S.D.A. Forest Serv. Res. Pap. NC-32, 8 p., illus. 1969.

Standing Timber Coefficients for Indiana Walnut Log Production, by James E. Blyth, Edwin Kallio, and John C. Callahan. U.S.D.A. Forest Serv. Res. Pap. NC-33, 9 p., illus. 1969.

ABOUT THE FOREST SERVICE . . .

As our Nation grows, people expect and need more from their forests — more wood; more water, fish, and wildlife; more recreation and natural beauty; more special forest products and forage. The Forest Service of the U.S. Department of Agriculture helps to fulfill these expectations and needs through three major activities:

- Conducting forest and range research at over 75 locations ranging from Puerto Rico to Alaska to Hawaii.
- Participating with all State forestry agencies in cooperative programs to protect, improve, and wisely use our Country's 395 million acres of State, local, and private forest lands.
- Managing and protecting the 187-million acre National Forest System.

The Forest Service does this by encouraging use of the new knowledge that research scientists develop; by setting an example in managing, under sustained yield, the National Forests and Grasslands for multiple use purposes; and by cooperating with all States and with private citizens in their efforts to achieve better management, protection, and use of forest resources.

Traditionally, Forest Service people have been active members of the communities and towns in which they live and work. They strive to secure for all, continuous benefits from the Country's forest resources.

For more than 60 years, the Forest Service has been serving the Nation as a leading natural resource conservation agency.